Tew-gwl Co

Manager, Tewaukon NWR

March 9, 1970

Asst. Regl. Refuge Supvr., Twin Cities (RF)

Annual Water Program - 1970

The annual water program for the Tewaukon Refuge has been reviewed and approved, as submitted, by the Divisions of Engineering and Wildlife Refuges.

Comments by the Division of Engineering are attached.

J. C. Carlsen

Carlsen 3/9

Attachment
JCCarlsen:mc 3-9-70

___Carpenter
___Greenwalt

___Carlsen
___Mennie
___Morgan

___Duncan
___Dundas
___Dybsetter
___Ellis
___Hoffman
___Reilly
___Rollings
___Winship
___Stenos

OPTIONAL FORM NO. 10
MAY 1962 EDITION
GSA FPMR (41 CFR) 101-11.6

UNITED STATES GOVERNMENT

Memorandum

TO : Regional Supervisor, Division of Wildlife Refuges

DATE: February 18, 1970

FROM : Acting Regional Engineer

EN-H-R-Tewaukon
1970 Annual Water Program

SUBJECT: Tewaukon NWR - 1970 Annual Water Program

We have reviewed the subject program and have the following comments.

Again this year the manager has done an excellent job of presenting a resume of the actual water management during year just ended. Considering the additional problems brought on by the spring flooding which made his job more difficult, we think his efforts in water management and record keeping are commendable.

The expedient repair of the damaged structures with the small amount of expenditures being incurred is also commendable.

In regards to the Nickerson Dike, there are no funds available at the present time to remedy the seepage problem. We would suggest that the manager continue to hold the water level in pool 3 as low as possible so as to prevent seepage to private land.

At a later date our Design Branch will provide the manager with information on a pump that could be powered by the 560 IHC tractor.

Carp screens for the control structures should not be an impediment to the operation of the structures. If they do, then we suggest that they be replaced with screens that would not prohibit manipulation of the stoplogs.

Regarding the problem of opening up the potholes that are being encroached upon by woody growth, Phragmites and Cattail, we have the following suggestion. After the ground freezes hard enough to support heavy equipment, shear a strip around the periphery of the pothole pushing sheared material towards center. This strip should be wide enough to provide a fire break area around the unsheared vegetation and the piles of sheared material. Burning

5010-108

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of all the vegetation sheared and otherwise can be accomplished under controlled conditions and no unsightly piles of brush or other vegetation is left in the pothole area.

Edwin B. Stevenson

Edwin B. Stevenson

Attachment

ANUAL WATER PROGRAM - TEWAUKON FUGE

I. 1969 Water Use Data

IMPOUNDMENT DATA

Pool 1, Lake Tewaukon for Calendar Year 1969

Month	Minimum Elevation Ft.-msl	Minimum Area (acres)	Minimum Capacity (ac.-ft.)	Maximum Elevation Ft.-msl	Maximum Area (acres)	Maximum Capacity (ac.-ft.)
Jan.	*1146.90	1235	8200	*1146.90	1235	8200
Feb.	*1146.90	1235	8200	*1146.90	1235	8200
Mar.	*1146.90	1235	8200	*1146.90	1235	8200
Apr.	*1146.90	1235	8200	1152.35	1322	14600
May	1148.00	1273	9620	1149.20	1295	11100
June	1147.80	1269	9360	1148.00	1273	9620
July	1147.90	1271	9500	1147.90	1271	9500
Aug.	1147.50	1257	9000	1147.80	1269	9360
Sept.	1147.30	1249	8740	1147.50	1257	9000
Oct.	1147.25	1247	8650	1147.30	1249	8740
Nov.	*1147.20	1245	8610	1147.25	1247	8650
Dec.	*1147.20	1245	8610	*1147.20	1245	8610

Pool 2, Cutler's Marsh for Calendar Year 1969

Month	Minimum Elevation Ft.-msl	Minimum Area (acres)	Minimum Capacity (ac.-ft.)	Maximum Elevation Ft.-msl	Maximum Area (acres)	Maximum Capacity (ac.-ft.)
Jan.	*1147.35	133	203	*1147.35	133	203
Feb.	*1147.35	133	203	*1147.35	133	203
Mar.	*1147.35	133	203	*1147.35	133	203
Apr.	*1147.35	133	203	1156.30	330	2970
May	1151.80	273	1060	1152.30	287	1200
June	1151.90	275	1080	1152.00	280	1120
July	1151.90	275	1080	1152.00	280	1120
Aug.	1151.80	273	1060	1151.90	275	1080
Sept.	1151.70	271	1025	1151.90	275	1080
Oct.	1151.60	266	1000	1151.70	271	1025
Nov.	*1151.40	262	945	1151.60	266	1000
Dec.	*1151.40	262	945	*1151.40	262	945

Pool 3, Maka Pool for Calendar Year 1969

Month	Minimum Elevation Ft.-msl	Minimum Area (acres)	Minimum Capacity (ac.-ft.)	Maximum Elevation Ft.-msl	Maximum Area (acres)	Maximum Capacity (ac.-ft.)
Jan.	*1153.00	108	265	*1153.00	108	265
Feb.	*1153.00	108	265	*1153.00	108	265
Mar.	*1153.00	108	265	*1153.00	108	265
Apr.	*1153.00	108	265	1158.00	133	900
May	1154.35	115	420	1154.80	117	470
June	1154.35	115	420	1154.50	116	440
July	1154.25	114	410	1154.50	116	440
Aug.	1154.15	114	395	1154.25	114	410
Sept.	1153.90	113	370	1154.15	114	395
Oct.	1153.65	111	340	1153.90	113	370
Nov.	*1153.55	111	330	1153.65	111	340
Dec.	*1153.55	111	330	*1153.55	111	330

* Ice

Pool 4 for Calendar Year 1969

Month	Minimum Elevation Ft.-msl	Minimum Area (acres)	Minimum Capacity (ac.-ft.)	Maximum Elevation Ft.-msl	Maximum Area (acres)	Maximum Capacity (ac.-ft.)
Jan.	*1158.10	70	210	*1158.10	70	210
Feb.	*1158.10	70	210	*1158.10	70	210
Mar.	*1158.10	70	210	*1158.10	70	210
Apr.	*1158.10	70	210	1162.40	180	462
May	1159.40	106	280	1159.80	117	305
June	1159.40	106	280	1159.40	106	280
July	1159.40	106	280	1159.40	106	280
Aug.	1159.00	93	261	1159.30	103	278
Sept.	1158.80	89	250	1159.00	93	261
Oct.	1158.75	87	247	1158.80	89	250
Nov.	*1158.65	85	242	1158.75	87	247
Dec.	*1158.65	85	242	*1158.65	85	242

Pool 8, Hepi Lake for Calendar Year 1969

Month	Minimum Elevation Ft.-msl	Minimum Area (acres)	Minimum Capacity (ac.-ft.)	Maximum Elevation Ft.-msl	Maximum Area (acres)	Maximum Capacity (ac.-ft.)
Jan.	*1173.80	88	185	*1173.80	88	185
Feb.	*1173.80	88	185	*1173.80	88	185
Mar.	*1173.80	88	185	*1173.80	88	185
Apr.	*1173.80	88	185	1179.80	110	820
May	1177.46	109	570	1179.40	110	775
June	1177.21	109	540	1177.46	109	570
July	1177.03	109	515	1177.30	109	550
Aug.	1176.30	108	440	1176.90	109	505
Sept.	1175.63	106	365	1176.30	108	440
Oct.	1175.50	106	355	1175.63	106	365
Nov.	*1175.45	106	350	1175.50	106	355
Dec.	*1175.45	106	350	*1175.45	106	350

Pool 11, West White Lake for Calendar Year 1969

Month	Minimum Elevation Ft.-msl	Minimum Area (acres)	Minimum Capacity (ac.-ft.)	Maximum Elevation Ft.-msl	Maximum Area (acres)	Maximum Capacity (ac.-ft.)
Jan.	*1147.60	37	52	*1147.60	37	52
Feb.	*1147.60	37	52	*1147.60	37	52
Mar.	*1147.60	37	52	*1147.60	37	52
Apr.	*1147.60	37	52	1151.40	85	280
May	1150.30	70	200	1151.00	79	252
June	1150.00	67	180	1150.30	70	200
July	1149.90	66	174	1150.10	68	187
Aug.	1149.00	57	119	1149.70	64	160
Sept.	1148.80	54	107	1149.00	57	119
Oct.	1148.70	53	100	1148.80	54	107
Nov.	*1148.65	52	100	1148.70	53	100
Dec.	*1148.65	52	100	*1148.65	52	100

* Reading, top of ice.

Pool 12, East White Lake for Calendar Year 1969

Month	Minimum Elevation Ft.-msl	Minimum Area (acres)	Minimum Capacity (ac.-ft.)	Maximum Elevation Ft.-msl	Maximum Area (acres)	Maximum Capacity (ac.-ft.)
Jan.	*1147.60	101	360	*1147.60	101	360
Feb.	*1147.60	101	360	*1147.60	101	360
Mar.	*1147.60	101	360	*1147.60	101	360
Apr.	*1147.60	101	360	1150.00	103	600
May	1150.00	103	600	1150.40	103	650
June	1150.10	103	610	1150.27	103	630
July	1149.80	103	590	1150.10	103	610
Aug.	1149.25	103	530	1149.65	103	570
Sept.	1148.70	103	470	1149.25	103	530
Oct.	1148.70	103	470	1148.70	103	470
Nov.	*1148.65	103	470	1148.70	103	470
Dec.	*1148.65	103	470	*1148.65	103	470

Pool 13, Mann Lake for Calendar Year 1969

Month	Minimum Elevation Ft.-msl	Minimum Area (acres)	Minimum Capacity (ac.-ft.)	Maximum Elevation Ft.-msl	Maximum Area (acres)	Maximum Capacity (ac.-ft.)
Jan.	*1208.85	47	195	*1208.85	47	195
Feb.	*1208.85	47	195	*1208.85	47	195
Mar.	*1208.85	47	195	*1208.85	47	195
Apr.	*1208.85	47	195	1215.08	64	675
May	1210.90	53	340	1211.60	57	395
June	1210.90	53	340	1211.70	57	405
July	1211.20	54	365	1211.70	57	405
Aug.	1209.67	51	233	1210.90	53	340
Sept.	1208.80	47	193	1209.67	51	233
Oct.	1208.50	45	179	1208.80	47	193
Nov.	*1208.50	45	179	1208.50	45	179
Dec.	*1208.50	45	179	*1208.50	45	179

Pool 14, Sprague Lake for Calendar Year 1969

Month	Minimum Elevation Ft.-msl	Minimum Area (acres)	Minimum Capacity (ac.-ft.)	Maximum Elevation Ft.-msl	Maximum Area (acres)	Maximum Capacity (ac.-ft.)
Jan.	*1211.20	174	937	*1211.20	174	937
Feb.	*1211.20	174	937	*1211.20	174	937
Mar.	*1211.20	174	937	*1211.20	174	937
Apr.	*1211.20	174	937	1214.64	**197	**1650
May	1211.80	178	1020	1212.60	182	1140
June	1211.80	178	1020	1211.80	178	1020
July	1211.70	177	1005	1211.80	178	1020
Aug.	1211.00	172	925	1211.65	177	995
Sept.	1210.70	168	893	1211.00	172	925
Oct.	1210.50	167	887	1210.70	168	893
Nov.	*1210.50	167	887	1210.50	167	887
Dec.	*1210.50	167	887	*1210.50	167	887

*Reading, top of ice. **Estimated

Small Impoundments, 1969 (Hepi Lake drainage)
(Minimum Monthly Elevation)

Month	Pool 2A	Pool 3A	Pool 5	Pool 6	Pool 7	Pool 7A
Jan.	dry	1154.77*	dry	dry	1170.90*	dry
Feb.	dry	1154.77*	dry	dry	1170.90*	dry
Mar.	dry	1154.77*	dry	dry	1170.90*	dry
Apr.	dry	1154.77*	dry	dry	1170.90*	dry
May	1153.40	1155.90	1158.30	dry	dry	1175.94
June	1153.00	1155.30	dry	dry	dry	1175.50
July	1152.70	1155.10	dry	dry	dry	1175.25
Aug.	1151.77	1153.85	dry	dry	dry	1174.60
Sept.	1151.45	1153.50	dry	dry	dry	1174.20**
Oct.	1151.27	1153.45	dry	dry	1170.20	1173.80**
Nov.	1151.20*	1153.40*	dry	dry	1170.15*	1173.60**
Dec.	1151.20*	1153.40*	dry	dry	1170.15*	1173.60**

(Maximum Monthly Elevation)

Month	Pool 2A	Pool 3A	Pool 5	Pool 6	Pool 7	Pool 7A
Jan.	dry	1154.77*	dry	dry	1170.90*	dry
Feb.	dry	1154.77*	dry	dry	1170.90*	dry
Mar.	dry	1154.77*	dry	dry	1170.90*	dry
Apr.	1154.00	1157.00	1163.10	1164.44	1172.90	1177.96
May	1153.80	1156.30	1163.10	dry	1168.00	1177.10
June	1153.40	1155.90	1158.30	dry	dry	1175.94
July	1153.00	1155.30	dry	dry	dry	1175.50
Aug.	1152.58	1154.85	dry	dry	dry	1175.15
Sept.	1151.77	1153.85	dry	dry	1170.40	1174.60
Oct.	1151.45	1153.50	dry	dry	1170.40	1174.20**
Nov.	1151.27	1153.45	dry	dry	1170.20	1173.80**
Dec.	1151.20*	1153.40*	dry	dry	1170.15*	1173.60**

*Reading, top of ice. **Estimated

Tewaukon Refuge, Consumptive Water Use For 1969

Pool	A Avg. Annual Evap.	B 1969 Lake Rise	C Net Gain A-B	D Surface Acres	E Ac-Ft Gain CxD	F Outflow in Ac-Ft	G Total Inflow Ac-Ft E+F
Sprague Lake	2.65'	-.70	1.95	176	343	Unk	*
Mann Lake	2.65'	-.35	2.30	53	122	"	"
Pool 12	2.65'	+1.05	3.70	103	381	"	"
Pool 11	2.65'	+1.05	3.70	63	233	"	"
Pool 10	2.65'	.00	2.65	6	16	None	None
Pool 9	2.65'	.00	2.65	10	27	None	None
Pool 8	2.65'	+1.65	4.30	107	460	Unk	*
Pool 7A	2.65'	+.10	2.75	14	39	"	"
Pool 7	2.65'	-.75	1.90	7	13	"	"
Pool 6	2.65'	.00	2.65	-	0	"	"
Pool 5	2.65'	.00	2.65	5	13	"	"
Pool 4	2.65'	+.55	3.20	104	333	"	"
Pool 3A	2.65'	-1.37	1.28	10	13	"	"
Pool 3	2.65'	+.55	3.20	115	368	"	"
Pool 2A	2.65'	+2.05	4.70	16	75	"	"
Pool 2	2.65'	+4.05	6.70	269	1802	"	"
Pool 1	2.65'	+.30	2.95	1267	3738	35,440	~~39,178~~
					7,796		43,416

*Not calculated.

Outflow Data, 1969, In C.F.S.

Lake Tewaukon Structure

Date	April	May	June	July	Aug.	Sept.	Oct.	Nov.
1	None	196.6*	22.2*	15.7*	13.1	19.3	3.7*	1.8*
2	"	154.8	16.4	15.7	13.1	19.3*	3.7	None
3	"	154.8	16.4	15.7	13.1	14.9	3.7	"
4	"	154.8	16.4	15.7	10.5*	14.9	3.7	"
5	3.7*	154.8	16.4	15.7	8.5	14.9	3.7	"
6	41.3*	154.8	16.4	15.7	8.5	14.9	3.7	"
7	134.4*	154.8	16.4	15.7	8.5	14.9	3.7	"
8	258.3*	154.8	16.4	15.7	8.5	14.9	3.7	"
9	517.0*	113.0*	16.4	15.7	8.5	14.9	3.7	"
10	863.5*	94.0	16.4	15.7	8.5	14.9	3.7	"
11	1021.0*	74.9*	16.4	15.7	8.5	14.9	3.7	"
12	1131.5*	62.0*	16.4	15.7	6.5*	14.9	3.7	"
13	1278.6*	53.3	16.4	15.7	3.2	14.9	3.7	"
14	1220.0*	53.3	16.4	15.7	3.2	14.9	3.7	"
15	1070.7*	53.3	16.4	15.7*	3.2	10.5*	3.7*	"
16	876.5*	53.3	16.4	15.7	3.2	7.1	2.8	"
17	611.5	53.3	10.5*	15.7	3.2	7.1	2.8	"
18	611.5	53.3	13.1	15.7	0*	7.1	2.8	"
19	611.5	53.3	13.1	15.7	14.7	7.1	2.8	"
20	611.5	53.3	13.1	15.7	14.7	7.1	2.8	"
21	346.4*	53.3	13.1	15.7	14.7	7.1	2.8	"
22	281.9	44.5*	13.1	15.7	14.7	7.1	2.8	"
23	281.9	33.4	13.1	15.7	14.7	7.1	2.8	"
24	281.9	33.4	13.1	15.7	14.7	7.1	2.8	"
25	281.9	33.4	13.1	15.7	29.4*	7.1	2.8	"
26	281.9	33.4	13.1	15.7	24.4	7.1	2.8	"
27	281.9	33.4	13.1	15.7	24.4	7.1	2.8	"
28	281.9	33.4	13.1	15.7*	24.4	7.1	2.8	"
29	281.9	33.4	13.1	13.1	24.4	7.1	2.8	"
30	217.4*	33.4	15.7*	13.1	19.3*	3.7*	2.8	"
31	-	22.2*	-	13.1	19.3	-	1.8*	"
C.F.S. Total	13681.5	2437.7	451.6	478.9	385.6	331.0	99.3	1.8
Ac-Ft Total	27136.9	4835.1	895.7	949.9	764.8	656.5	197.0	3.6

C.F.S. Grand Total = 17,867.4 AC-FT Grand Total = 35,439.5

*This is known data, all other figures are interpolations.

Water ran over top of dike on Lake Tewaukon during flood, not calculated. Water also entered from drainages to where Cayuga gauging station is located, hence the higher stream flow reported at gauging station.

SUMMARY OF 1969 WATER PROGRAM

Winter Conditions

The winter of 68-69 will long be remembered for its length, coldness, deep snow and windy, blustery conditions. Except for a brief period of warm weather in March, snow that fell in December had not melted well into April. Shelterbelts, ditches, drainages and coulies were full of snow and a large runoff was expected when warm weather finally came.

Spring Runoff

Wild Rice River Watershed

Temperatures warmed during the evening of March 31st and it was windy. The first sheet water appeared the next day and small drainages had begun flowing by April 3rd. And, then the floods came.....

Peak river flows reached the Sprague Lake Unit on April 6th. Water coming in from the T1-A watershed dam and surrounding drainages sent Sprague Lake up 2.5 feet in two days. The large volume of water became too much for the three culverts under the township road north of the lake to handle and washed them out in its path to the river. Sprague Lake reached 1214.64 on the 6th. It had lowered 1.5' by the 22nd.

Mann Lake reached its peak elevation (1215.08 -- highest since gauge records were begun) on the 6th also, raising over 5' in two days.

By the 9th peak flows had reached Pool 4 sending its elevation to 1162.4 (structure top 1162.0). At this time 1,183.65 c.f.s. were calculated running through the 30' structure plus that which went over the dike. The dike had not established grass and some washing did occur. Most extensive was around the south wingwall of the structure where the swirling current cut out a hole about 4' deep by 8' long. Hay bales were placed here to prevent further erosion. Water quit running over the dike by the 11th when the pool had dropped to 1161.75. It dropped rapidly after this to 1159.65 on the 16th. Ice jams were a real problem here and were fought daily and into the evenings on the 8th, 9th and 10th.

Rain amounting to 1.5" fell on the 9th and 10th. If not for the rain we would have been in a better position to handle the flood water. This precipitation only added to the snow already melting and created a larger volume of runoff.

Pool 4 was held as high as possible to keep water from going over the old Nickeson dike in Pool 3.

Our efforts were in vain. Even with pulling all stoplogs possible,

Pool 3 continued to rise. Ice jams took out many logs as well and busted up the cat walk. Sometimes the ice jams would be quite impressive when one could almost feel the structure give. Water ran into Nickeson's bottom from the 9th to the 12th, and leaked in for a time after this. We attempted to plug the muskrat runs through the dike but it was impossible because of the water pressure. The elevation on Pool 3 was at 1158.0 on the 9th, this was two feet lower than the top of the dike. Pool 3 had dropped to 1153.75 by the 22nd.

Water was held in Pool 2 as much as possible to keep the heavy flow from Lake Tewaukon structure which had to handle the flow which enters from the south side of Skrock's Bay as well as that from the river. Water was so high at one point we had to put a tarp and hay bales around Pool 12 structure to prevent water from backing over into East White Lake. Water went over the dike on Pool 2 on the 10th but it was grassed heavily and little wash occurred. Hay bales were placed around the structure to lessen washing. Pool 2's high reading was on the 10th (1156.30), with 1,590 c.f.s. calculated from the structure at this time. It was ice free by April 13th and had dropped to 1153.0 by the 16th. Ice jams were less serious here than on Pools 1, 3 and 4. However, the jams did break loose one carp barrier from the structure.

Lake Tewaukon rose 5.5' from its winter reading to a high of 1152.35 on the 13th. Water built up in North Bay on the state land and ran into Krause's slough for an undetermined time (probably two days). Krause built a small dike to keep additional water from running onto his land on the 14th of April. A beaver's lodge washed in its entirety into the dam and together with ice had all but restricted the flow in half of the bays on the 13th. It took about 12 man-hours to remove the lodge and ice so that water could run free out of the structure again.

Ice tore out one carp barrier on the dam so we pulled as many logs from that bay as possible. These barriers are impossible to remove during fast water so we couldn't get stoplogs out. One other barrier was pulled out with log chains, nylon rope and a 4-wheel drive pickup but it took a good deal of time. As many logs were removed as we could but we need a mechanical puller for getting logs out.

By taking out more logs we would have only added to the outflow which, downstream of Dam 1, was threatening bridges and the blacktop road 2 miles south of Cayuga. The road had started to erode with water already going over it. Pool 1 was ice free by April 15th. A winter kill of most fish life in the pool was evident, including carp, suckers, game fish and bullheads.

White Lake Watershed

Both Pool 11 and 12 were held low over winter, which proved beneficial.

Even with the relatively small drainage area south of the White Lakes, Pool 11 rose to 1151.40 on April 15th, its high reading. Water was passed through to Pool 12 so Harold Lee's land wouldn't be affected by high water. If we had received a larger volume of water from the drainage we had no place to run it because of high water in Pool 2. Both pools froze out over winter and many dead fish were seen in Pool 12, but few in Pool 11. About 8 large northerns (15 pounds and over) were found in Pool 12. Most carp were small--1 to 4 pounds. Pool 11 was ice free by April 8th and Pool 12 by April 15th.

Hepi Lake Watershed

Hepi Lake had about 5' of free-board going into spring breakup. Because of fighting flooding on other pools we did not get a gauge reading on the pool until April 16th. On this date its elevation was 1179.8, a peak for the spring, and up 6' in 15 days. It was running over the spillway (elevation 1179.0) when checked, filling Pool 7A. It continued going over the spillway until May 4th when water coming in from T-2 watershed dam had slowed enough so the Hepi Lake control culvert could keep up with it.

The millet grown in Pool 7A was flooded with spring breakup water. Because of the heavy volume of water entering Pool 7A from Hepi Lake it was passed through both 7N structure as well as the small structure separating Pool 7 from 7A. Pool 7A read 1177.96 on April 22nd, its high for the spring. The pool had trails flooded during this time so we couldn't get to it readily.

Water was alloved to run through Pools 7 and 6 during the spring as our plans were to dry the pools up and seed rye for flooding for invertebrates. Pool 7's high reading for the spring was 1172.9 and Pool 6 reached 1164.44.

Our plans were to hold Pool 5 as high as possible during the spring to flood manure dumped around the periphery last year. However, the structure developed a leak and the pool read 1163.1 on May 1st but had dropped to 1159.8 on the 12th. Pool 3A was filled to capacity (1157.0) during the spring runoff from water coming down from Hepi Lake.

Pool 2A was flooded with water from Pool 3A to the 1154.0 elevation. The stoplogs leaked water into Pool 2 during the spring loosing about one-half foot of water by the end of May.

Summer Water Conditions

Wild Rice River Watershed

The heavy spring runoff was short-lived and by May 1st the river

flow was returning to normal. We experienced a very dry summer here but legal drains in the Brampton-Cogswell area and east were cleaned during the summer, adding water to the river, which was still flowing on the Sprague Lake Unit well into November. Normally, with a dry summer, we'd expect the river to quit running by mid-August.

Mann Lake closed out the year at 1208.60, .35' lower than a year ago.

Sprague Lake was .7' lower (at 1210.50) than last winter which reflected the drier conditions. It held at 1211+ throughout most of the summer.

Stoplogs were placed at 1158.65 on Pool 4 structure after the spring runoff. The pool held at 1159.4 during most of the summer, due to river flow. The dike was repaired with black dirt placed on it and seeded. Fill was also placed and packed around the structure which had washed during the spring flood. Water still ran out of the dam until mid-November. It was at 1158.65 at freeze-up. Roy Glarum found it necessary to move his goose pits from the river bottom due to the high water table caused by Pool 4.

Pool 3 was held low (about 1154.2) during the summer. The old Nickeson dike could stand no more than this. As it was, seepage probably occurred into Nickeson's land during part of the summer if our side was higher in elevation. With this lower elevation cattail is encroaching into Pool 3. Something must be done with the Nickeson dike before we can best manage the pool. Pool 3 was at 1153.55 at freeze-up which occurred on most impoundments during mid-November. Water flowed from the structure until November 1st.

Stoplogs in Pool 2 were held at 1151.55 during the summer (some bays higher or lower). With a good river flow it held at 1151.9 during most of the summer. It has become a little more choked with cattail but it is still well interspersed and provides cover for moulting ducks in July. A few carp made it into the pool during the spring flood but it is primarily free of carp. It was held at 1151.4 at freeze-up.

Pool 1 (Lake Tewaukon) held at 1147.5+ during the summer and was at 1147.2 at years end. This was .3' higher than last year. Water ran out of the pool until November 1st. Open water and ducks were present on the lake until late December. The heavy runoff this spring had gouged a huge hole downstream of Dam 1, probably 8-10' deep and 20 feet across. This we filled in and packed during the summer and new riprap was added to the side slopes which had washed away.

The rich-in-Indian-artifacts "Point" on Lake Tewaukon continues to be eroded away with the south side dropping off a couple feet a year. The lake received little public use this year because of the winter kill of fish. This not only cut down on fishing but the dead fish

stunk and provided a breeding place for flies. Algae bloom occurred early as well.

White Lake Watershed

Pool 11 received runoff from the south until early May when it quit. This pushed Pool 11 up to 1151.4 on April 16th which necessitated us to pull logs on Pool 11 structure and run water into Pool 12. Water seeped through the logs during the summer and both pools equalized by fall, reading 1148.65 at freeze-up, about 1' higher than last year.

Hepi Lake Watershed

High water this spring coming in from T-2 watershed dam kept us from releasing it through the culvert and water ran over the Hepi Lake spillway into the 1st week of May. The pool held at 1176.50 +- through the summer and water was released to add to Pool 7A and flood Pool 7 bringing the elevation down to 1175.45 at freeze-up.

Pool 7A was flooded during spring runoff. It held at 1175.5 until the dry summer weather came and dropped rapidly after this. It was 1173.6 at freeze-up.

Pool 7 was kept dry during the summer and a heavy growth of smartweed was flooded this fall in September for waterfowl useage. It remained at 1170.15 at freeze-up.

Pools 6 and 5 were rotary mowed, burned and cultivated during the summer. A crop of rye was seeded but because of dry weather it grew little. This was done on Pool 6 because of the heavy cattail growth which had taken over the pool. Willows were also a problem. Pool 5 structure was repaired during the summer with a concrete collar poured around the culvert for stopping the seepage.

Pool 3A, filled from Hepi Lake during the spring, leaked during the summer but held some water. It was at 1153.4 at freeze-up. Cattails are invading the upper end of the pool and should be controlled.

Pool 2A dropped from 1154.0 in April to 1151.77 in August to 1151.20 at freeze-up. These stoplogs also leak and will be replaced as cattail is severely invading the pool due to the low water levels. The level was equal with Pool 2, which we knew would be too low for optimum marsh.

Potholes

The heavy snow cover of last winter had potholes filled to overflowing when spring runoff came. In fact, some new ones were made with the flooding that occurred. Potholes held up well until the third week of July when a dry spell occurred. We had only .29" precipitation from July 30th to September 23rd. Precipitation falling

in October did little to help the situation and they will need much additional runoff from snow next spring if they are to prove attractive to ducks.

Food, Cover and Waterfowl Use

Millet, flooded in Pool 7A during the spring, attracted many ducks and geese during migration. The pool also received a lot of use by herons and egrets which rested in the willow growth in the pool. When the pool receded this fall the geese used the mud flats for resting. Acre for acre this was probably the best area on the refuge for 1969. Broods were also noted on the pool.

Pools 4 and 11 both had good brood use and sago beds in Pool 11 attracted many ducks and coots during late summer.

Pool 12 had flocks of up to 125 redheads in the spring--its first noteable waterfowl use. Hepi Lake received little use except during the fall migration. No broods were noted on Hepi, Tewaukon, Mann or Sprague Lake during the year.

A flooded area north of Sprague Lake during the spring attracted many ducks for about two weeks (2,500). This area is the one we intend to acquire in land exchange, and 160 acres of which we already own.

Moulting ducks used Pools 3 and 2 a great deal this year, with the bulk mallards. The heavy growth of cattail in Pool 2 with broken down trees and interspersion proved most attractive.

Shovelers again preferred Lake Tewaukon during the fall. Divers were abundant in Hepi Lake and geese used it most for resting and watering this fall.

Smartweed and other vegetation flooded in Pool 7 was attractive to mallards, gadwall and GWT as well as some divers.

Pool 9 was used during the fall for resting but little use was noted during the summer.

1969 Flood Damage Which We Repaired:

Backfilled wingwalls of Dam 4 structure with clay.

Covered Dam 4 with black dirt and seeded.

Pumped about 5' of water off Show Pool, 8 acres in normal size, at least 40 acre feet. This took about a week because of poor equipment.

Hired a contractor to build up a levee west of Show Pool 0.5' higher than Dam 2 to prevent further flooding. Also raised our patrol road south of Cutler's Marsh, $483.00 total cost.

Hauled 40 loads of rock and dozed it into large hole below Dam 1. About 10 man-days here.

Raised Dam 12 about one foot.

Hauled D-6 to Maple River and filled end walls of Dam. Two man-days here, including seeding.

About 60 stoplogs were lost or damaged and have not been replaced.

Cost of flood damage repairs completed is about $1300.

1970 ANNUAL WATER PROGRAM

The Water Program is described for the Tewaukon Unit and for the Sprague Lake Unit. The Tewaukon Unit is described according to water source: Wild Rice River, Direct; White Lake Watershed; and Hepi Lake Watershed.

Tewaukon Unit

I. Wild Rice River Watershed, Direct

Pool 4

We plan to hold this at 1158.0 to 1158.5, depending on what looks to be the best level in the pool margins.

Carp can come downstream from White Lake South Dakota, Silver, Sprague and Mann Lakes. We will not have a barrier to their movement this year. They will also be able to move upstream, but we do not have a large population in the refuge and don't have to be much concerned this year.

Pool 4 should go into the winter at about 1158.0 to encourage house building by muskrats.

Pool 3

This pool cannot by managed properly until the Nickeson Dike is rebuilt. Cattail is invading much of Pool 3 and we aggravate the situation with a low water level.

We ought to leave Pool 3 dry all summer, providing we can rebuild or repair the Nickeson Dike. Any water in Pool 3 will either cause seepage through the Nickeson Dike or maybe prevent water from seeping out of the dike from Nickeson's private farmland. I believe we cannot allow our management to further flood his land and if we can drain the water off his land without conflict to our operations, we should do it. In fact, we'll probably have to cut the dike to drain water out before we can repair it.

Pool 2

We do not expect to have to dewater Pool 12 into Pool 2, so intend to manage Pool 2 by itself. We plan to hold it full, at 1152.0, through the summer and into the winter. A high stable level should flood out some cattail and encourage house building by muskrats. A good interspersion with lots of loafing placed should improve Pool 2 for waterfowl use, though it is pretty good now.

Pool 1

Lake Tewaukon will be held somewhere between 1147.0 and 1147.5.

This is high enough for fishery management and recreation without excessive bank erosion.

Our very cumbersome carp barriers will have to be removed if flooding seems likely. We should leave them in place if we can to block upstream movements of carp.

Skroch's Bay, an 80 acre bay on the east side of the lake, we hope to keep carp free by blocking the old culvert under the grade separating the lake and bay. It was plugged with sand and gravel by the flood last spring.

II. White Lake Watershed

Runoff from the T-2 or Frenier Dam is into Hepi Lake. The local runoff going into White Lakes should not be a problem.

Pool 11

We believe this is carp free now. Stoplogs will be placed and locked down at 1150.5. We want all the water we can hold in Pool 11 without flooding private land to the south. If we can go to 1151.0, we'll do that. The pool should be held high into the winter.

Pool 12

This should be held as low as possible. Though probably carp-free last year, it did have suckers and bullheads in it. The water was murky and pondweeds did not develop in Pool 12.

It would be well to dry this pool up if possible. Evaporation would be the only way at present. We need a moveable high capacity pump for managing the White Lakes and other small pools. Output should be at least 5,000 gallons per minute. We have a 560 International tractor to drive such a pump with power-take-off. We request assistance from Engineering in the form of plans for such a pump which we could build, or information on commercial pumps. Output could be up to 20,000 g.p.m.

III. Hepi Lake Watershed

With about 8" of snow cover going into 1970, it appears as if adequate runoff will occur. We plan to hold Hepi Lake at 1178.0. This will provide a water supply for downstream pools and be suitable for pondweed growth.

Pool 10

No water will be added from Hepi Lake. We believe there are minnows in Hepi and don't want to infest Pool 10 with them.

Pool 9

No water will be let in from Hepi. There are probably still minnows present but it may not be worth the effort to eradicate them.

Pool 7A

We intend to dry this up after runoff and plant a crop of millet in the pool for flooding in the spring of 1971.

Pool 7

This will be flooded full in the spring, possible by dewatering 7A into it. We'll hold it full.

Pool 6

This should be flooded to drown out willows and cattails along the pool margin, which are presently disced up. The water can be kept full into the winter.

Pool 5

The same applies here.

Pool 3A

There appears to be a leak in this structure, either by the control gate not sealing or by seepage along the structure. This should be sealed and Pool 3A kept as full as we can get it. A heavy stand of emergents will thus be opened up and open shoreline will appear behind the emergents. This is a good marsh which can be better.

Pool 2A

This structure also leaks, either the stoplogs or along the CMP structure. Repairs must be made and the pool should be flooded. Evaporation will occur and if we had a suitable pump, water could be taken from Pool 2 to flood 2A in the fall. There is a heavy cattail stand here which muskrats will open up provided there is enough water in the pool.

Sprague Lake Unit

Sprague Lake

As there are no controls on this lake management of the water level is not possible.

Mann Lake

This lake is directly connected with the Wild Rice River and no water controls are available for regulating lake elevations. No management of water levels will be possible in 1970.

Potholes

Our potholes on Tewaukon generally need opening up. Many are overgrown with cattail or phragmites and most have willows or cottonwoods growing around them. We sprayed a lot of these trees last fall, but the dead vegetation, we believe, reduces pair use. We need to maintain these more open, which can be done in several ways. One is to spray the trees, which kills them but does not remove them. Another way would be to rotary mow them, but this has to be done when the potholes are dry and is hazardous because there are often rocks around and in the potholes. A dozer could be used to scrape the trees off, but then there is a pile of dead vegetation.

Burning these potholes to open them up appears to be a worthwhile approach, but this is difficult to do. Perhaps a combination of dozing open a fire break on the shoreline and then burning the potholes out with a snow cover may be the way to do this.

There is no question that the potholes are becoming choked with vegetation and trees. There probably is little doubt that this is reducing pair and brood use. Since waterfowl production is our primary goal, we have got to manage these open. Controlled burning of potholes alone or potholes and grasslands together may be our best approach.

We have done some blasting to deepen perhaps a dozen shallow potholes but believe this is not worthwhile. The construction of new shallow Type I or III potholes with a dozer in favorable sites is well worth a try. We just need the time and correct soil conditions to do this.

In the NW part of the refuge, along the Wild Rice River NW of Hepi Lake, there is flat land which could be developed like the 341 Development Unit at J. Clark Salyer. That is, a chain of dugouts connected by ditches and flooded from the river to form more pair territories.

Other possibilities exist for intensive management which we hope to prepare plans for and send in for review.

January 8, 1970

Herbert G. Troester

Herbert G. Troester
Refuge Manager

1969 Easement Refuge Water Use - Tewaukon District

Bonehill Refuge was flown over once during the year, in September. It was visited during the summer but not closly inspected. We believe it held high water levels because of the great amount of runoff received in the pool last spring and the area had good precipitation during the summer.

The Maple River Refuge was flooded during April. The entire structure was probably under water for a short time as fill around the end walls was washed considerably. The bridge south of the refuge and others further downstream were washed out. New fill was added around the end walls and seeded in September. At years end the water level was 15" below the spillway.

Water levels in Lake Elsie were high after spring runoff. At freeze-up this fall the level is probably lower than last year because of the dry summer conditions.

Water conditions in Storm Lake Refuge were about the same as last year.

The Wild Rice River Refuge had the highest stream flow in many years and held water during the year but was limited to the channel after the flood receded this spring. Water ran in the channel into October.

Easement Refuges, Consumptive Water Use For 1969

Refuge	A Avg. Annual Evap.	B 1969 Lake Rise	C Net Gain A+B	D Surface Acres	E Ac-Ft Gain CxD	F Outflow in Ac-Ft	G Total Inflow Ac-Ft E+F
Bonehill	2.65'	+.20*	2.85	40	114	Unk.	Unk.
Lake Elsie	2.65'	-.30*	2.35	317	745	Unk.	Unk.
Maple River	2.65'	-.20*	2.45	93	228	Unk.	Unk.
Storm Lake	2.65'	.00*	2.65	181	480	Unk.	Unk.
Wild Rice	2.65'	+.20*	2.85	4	11	58,708	58,719

*These are estimated figures.

Physical Condition of Control Structures

Bonehill Refuge

Good condition, see photos in 1966 report.

Lake Elsie Refuge

There are no control structures on this area.

Maple River Refuge

Control structure in good condition. Small structure north of new dam is largely ineffective.

Storm Lake Refuge

Control structure ineffective.

Wild Rice River Refuge

No control structure.

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Control structure ineffective.

Wild Rice River Refuge

No control structure.

Photo #1 - Dam 4 showing damage after spring flood. We have repaired this, capped the entire dike with black dirt and seeded it to grass.

Photo #2 - From the township road just east of Dam 4, looking east to the old Nickeson Dike, overtopped by flood water. We widened this some last year, but it has got to be rebuilt. We cannot properly manage Pool 3 until it is. Or we should attempt to buy Ed Nickeson's land beyond, which is the best solution.

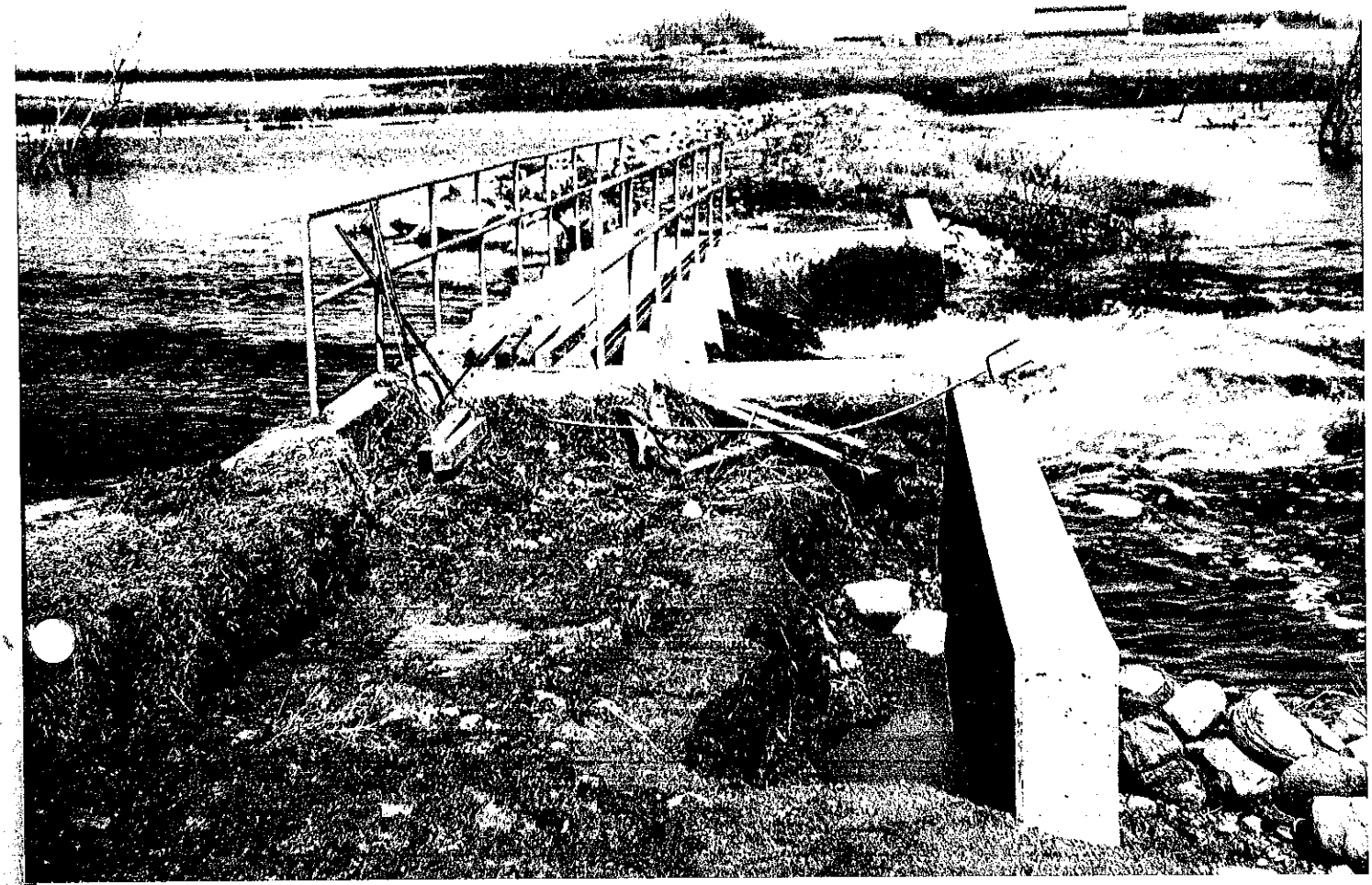


Photo #3 - Dam 2 with flood water running over it.

Photo #4 - Dam 1 about the time the flood crested. Water ran over the dike at the north end of the structure. Our heavy carp barriers could not be pulled with the large flow of water, so most stop-logs were in place.

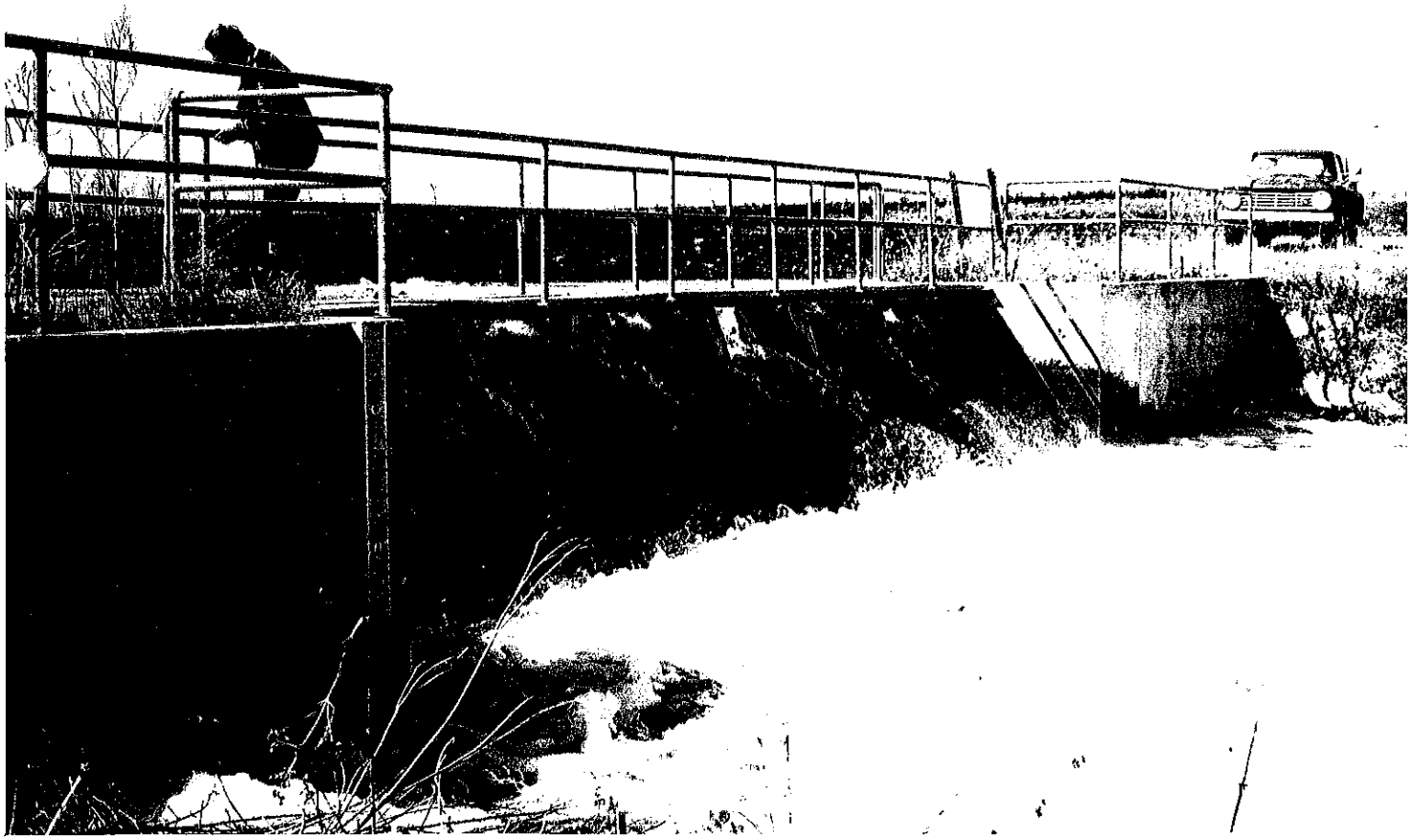


Photo #5 - Dam 1 showing trash washed against it. Gary Krause looking on, whose own land was flooding from Pool 1 at this time.

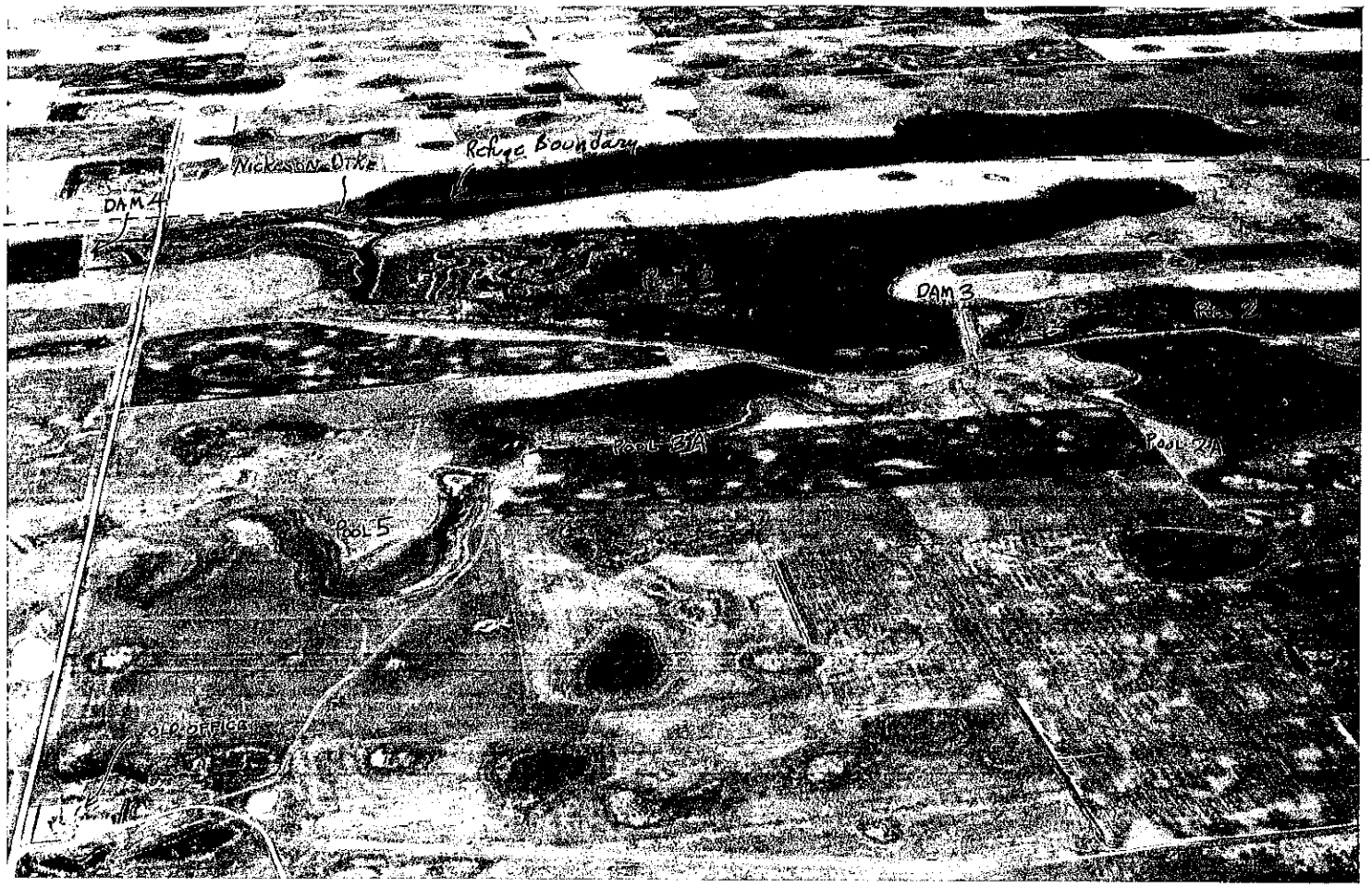
Photo #6 - A very deep hole scoured out downstream of Dam 1. We hauled 40 loads of rock and pushed them into this hole. This repaired flood damage to Dam 1.

Photo #7 - Most fish winter killed in Lake Tewaukon. Our carp problem was alleviated, but we lost a very fine walleye fishery.

Photo #8 - Skroch's Bay at the east end of Lake Tewaukon. This is only about 18" to 2 feet deep and a favored carp spawning ground. Pondweeds prospered here after the carp killed out.

Photo #9 - Aerial photo of September 9, 1969. A view to the north to Pool 3. Dam 4 at left, Pool 5 lower left, Pool 3A, Dam 3, upper end of Pool 2 and Pool 2A at right. The big long pool at the top is Ed Nickeson's farmland, flooded over the dike at left. It would be cheaper to buy this land than to rebuild the dike. This would be a very valuable marsh for waterfowl management. It should be part of the refuge.

Photo #10 - Photo of September 9, 1969. Lake Tewaukon in the foreground, Dam 1 top left, refuge boundary, and the path where Pool 1 overflowed into the Krause Slough ("Deep Bay" of the Master Plan).


Nickerson Dike
Refuge Boundary
DAM 4
DAM 3
Pool 2
Pool 3A
Pool 2A
Pool 5
OLD OFFICE


DAM 1
STATE GAME MGT. AREA
Refuge Boundary

Photo #11 - Photo of September 9, 1969. Main features of interest are upper reaches of Pool 4 and Pool 7A.

Photo #12 - September 9, 1969. A view south over the Bonehill Easement Refuge.

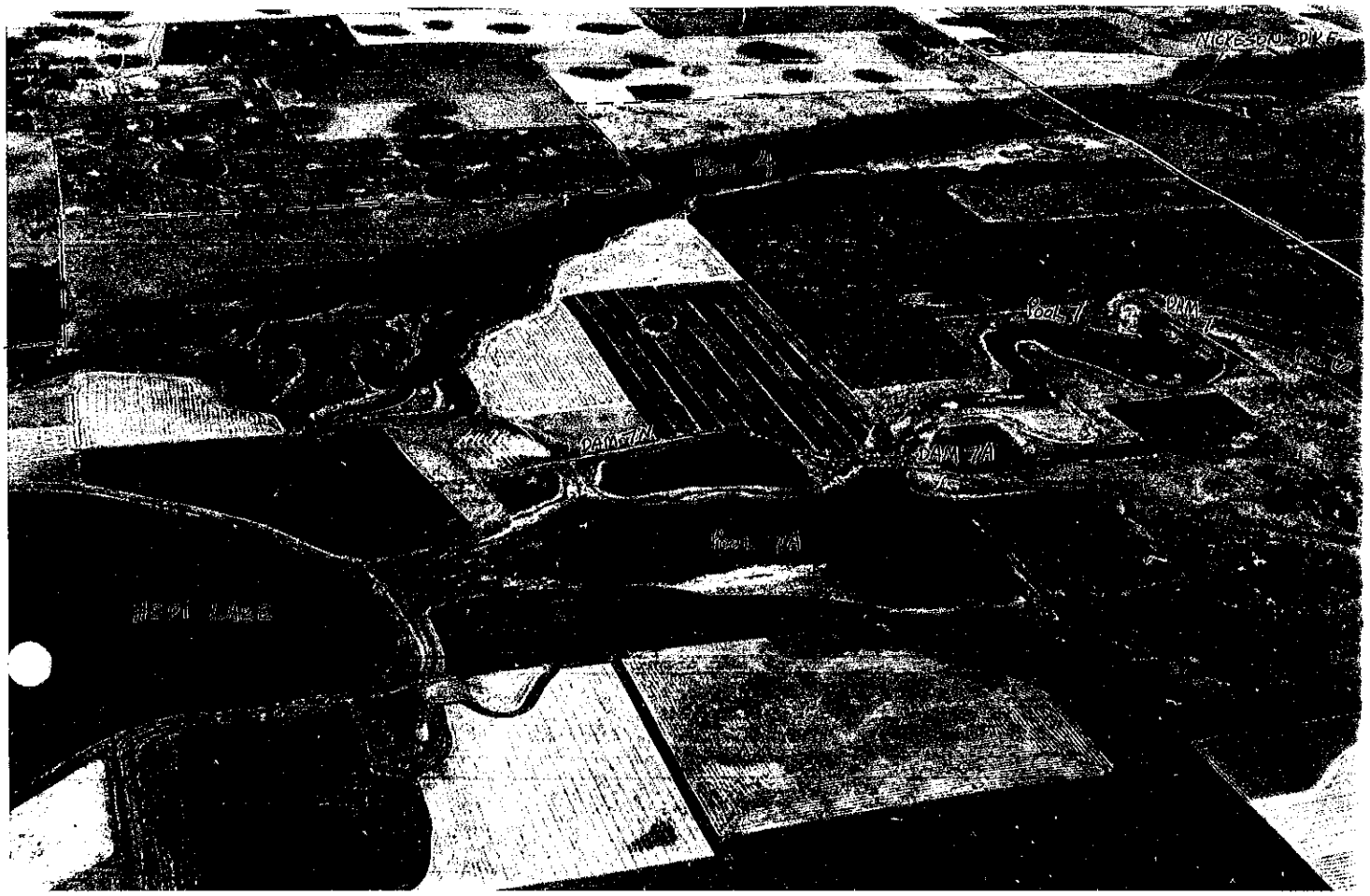
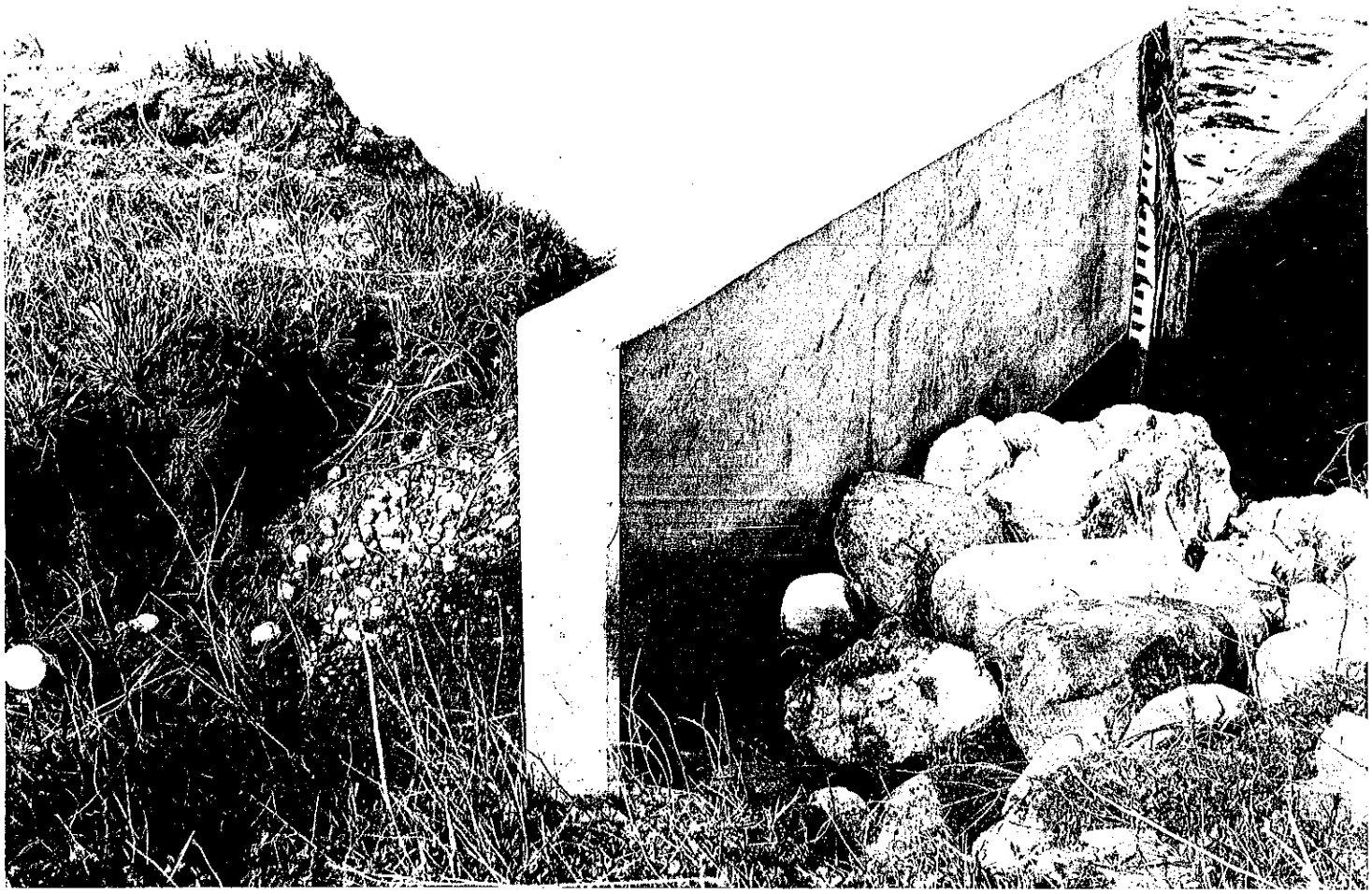

NICKSON DIKE
DAM 7A
DAM 7A

Photo #13 - Flood damage at the Maple River Dam. Both end walls were scoured out like this.

Photo #14 - A contractor from Oakes bid $800 to repair the dam. We did it ourselves with the dozer and reseeded it.



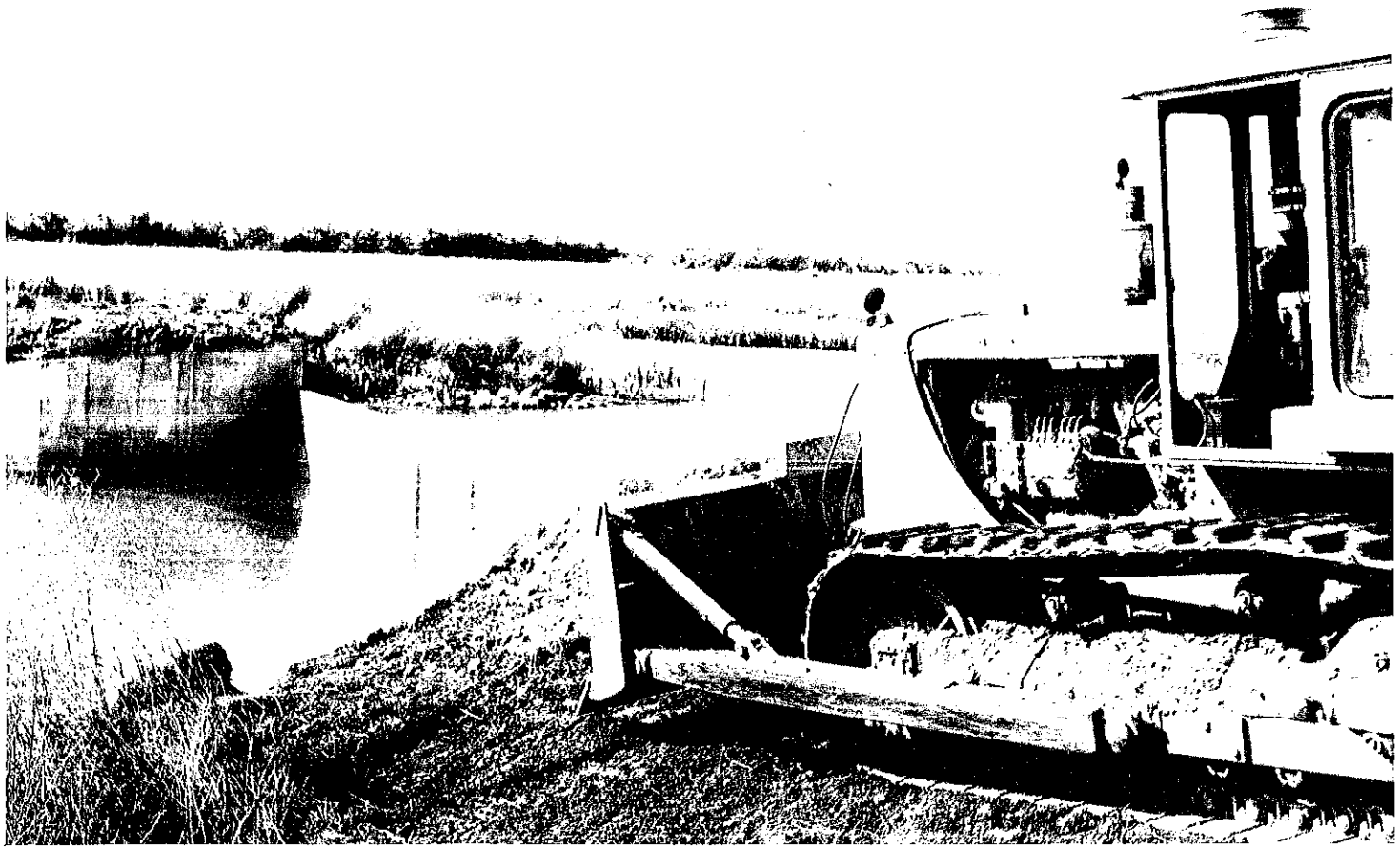


Photo #15 - Cattail is a problem, especially in Pools 5 and 6 and 2A. We dried up Pools 5 and 6, mowed and burned cattail and willows, and cultivated the pool bottoms. We seeded them to rye for flooding in the spring of 1970 as a green crop for invertebrate production for waterfowl.

Photo #16 - Willows and cottonwoods encroach around most potholes here. It will be a continual battle to keep these potholes open for waterfowl pair use. Spraying, mowing, dozing and burning are the methods we have to use. Mowing is hazardous until rock piles are cleaned up. Burning will probably be our best tool.